TRANSACTIONS

of the

DUMFRIESSHIRE AND GALLOWAY NATURAL HISTORY

and

ANTIQUARIAN SOCIETY

FOUNDED 20 NOVEMBER 1862

THIRD SERIES VOLUME 93
XCIII

Editors:
DAVID F. DEVEREUX
JAMES FOSTER

ISSN 0141-1292

2019
DUMFRIES

Published by the Council of the Society

BARWHILL REVISITED: RETHINKING OLD INTERPRETATIONS THROUGH INTEGRATED SURVEY DATASETS

Dave Cowley[1], Richard Jones[2], Giles Carey[3] and Juliette Mitchell[4]

A suite of archaeological remains, including a group of barrows, a later Iron Age settlement and a stretch of Roman road at Barwhill, just north of Gatehouse of Fleet, are explored using aerial photographic records, geophysical survey and Airborne Laser Scanning data. These have provided new insights into the remains which were first recorded in 1949. Of note is the revision of an earlier identification of a square example amongst the barrows. This paper highlights the importance of systematic review of the survey evidence and the benefits of complementary datasets. The wider context for the group of barrows is discussed, identifying the need for excavation to provide dating evidence for a poorly understood corpus of burial sites that may span the Iron Age, Roman and early medieval periods.

Introduction

The suite of archaeological remains at Barwhill, lying just north of Gatehouse of Fleet on the east bank of the Water of Fleet (Figure 1), comprises a section of a Roman road, a rectilinear double-ditched enclosure and some ring ditches, interpreted as ditched barrows, and known from aerial photographic recording (Canmore ids: 63640, barrows; 63665, enclosure; 63646, Roman road). These have been discussed in the pages of a past volume of these *Transactions* in a paper reviewing the evidence for square barrows, potentially of first millennium AD date, in Dumfries and Galloway (Cowley 1996). The present paper presents a re-interpretation of a key aspect of the remains at Barwhill prompted by the results of geophysical survey undertaken in 2012 and 2014. Here, critical review of the earlier interpretation of the aerial photographic record, combined with the results of the geophysical survey, undermines the assertion that one of the ring ditches is square (Cowley 1996, 108). The review of the earlier interpretation and the integration of two survey datasets raises interesting points about the processes of observation and demonstrates the benefits of integrating multiple datasets. This benefit is reinforced for a specific aspect of the remains at Barwhill by reference to a third source of information — Airborne Laser Scanning 3D topographic data collected in 2011–12.

1 Historic Environment Scotland, dave.cowley@hes.scot.
2 Archaeology, University of Glasgow, Richard.Jones@glasgow.ac.uk.
3 Formerly *Discovering Dumfries and Galloway's Past* Project Officer, gilescarey@gmail.com.
4 University of Aberdeen.

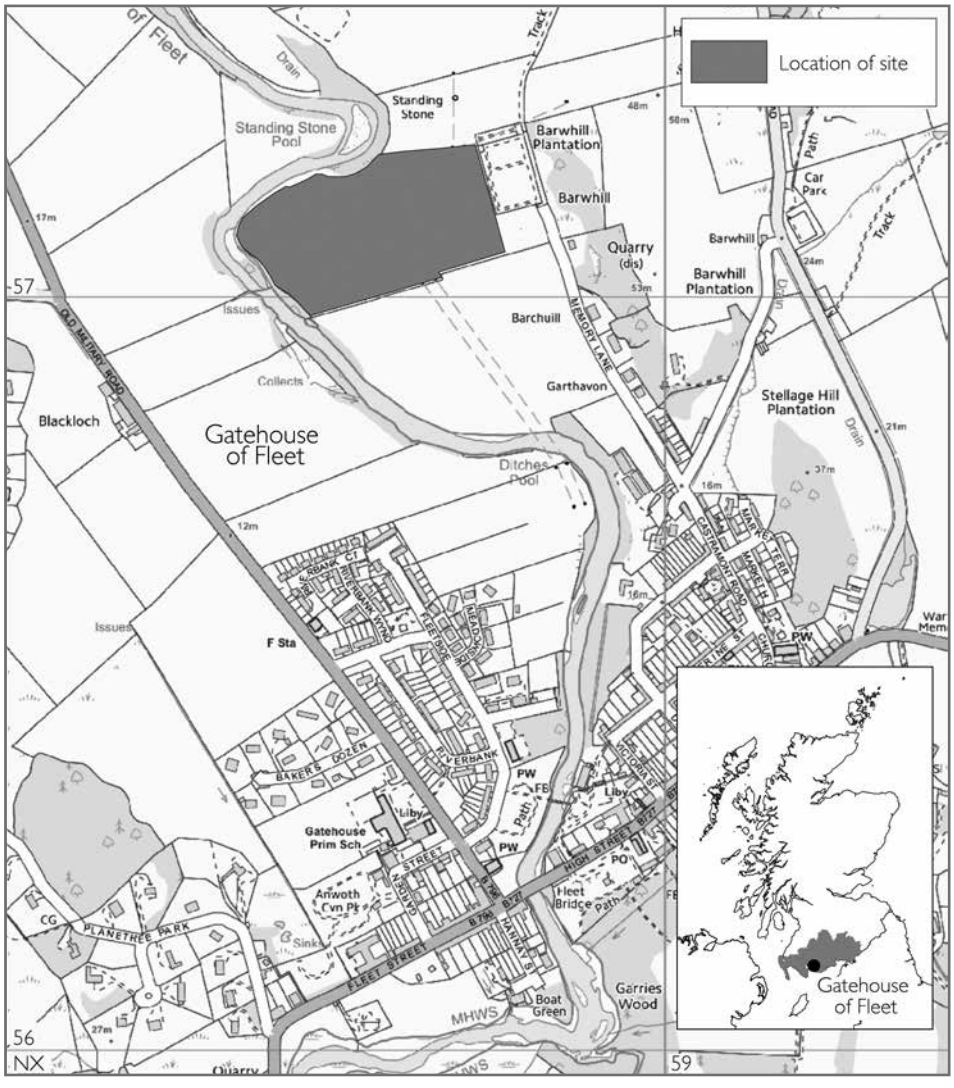


Figure 1. The location of the remains at Barwhill discussed in the text. GV007607 ©Historic Environment Scotland. Map ©Copyright and database right 2020 Ordnance Survey licence number 100057073.

The aerial photographic record

Barwhill was discovered from the air in early July 1949 by J.K. St Joseph of Cambridge University during a period of exceptional drought (St Joseph 1951). The conditions were highly conducive to the formation of cropmarking in arable crops and extensive parching of pasture, with St Joseph noting that the '… discoveries in the single year 1949 have literally changed the map' (St Joseph 1976, 7). He recorded the site as differential parching of the pasture shortly after a grass crop had been taken (haystacks dot the field in the aerial

photographs). These aerial photographs show darker tones of lusher grass across buried ditches and pits and areas of deeper soils due to underlying geological features (ancient water channels), also revealing a double-ditched enclosure, quarry pits flanking the Roman road and four ring ditches (Figure 2: A, B, C & D). All the barrows appear broadly circular on plan, and there are diffuse marks within the interiors suggestive of burial pits. Areas of shallower soils and the intermittent line of the Roman road are visible as lighter tones, indicating the parched state of the grass in these areas of the field.

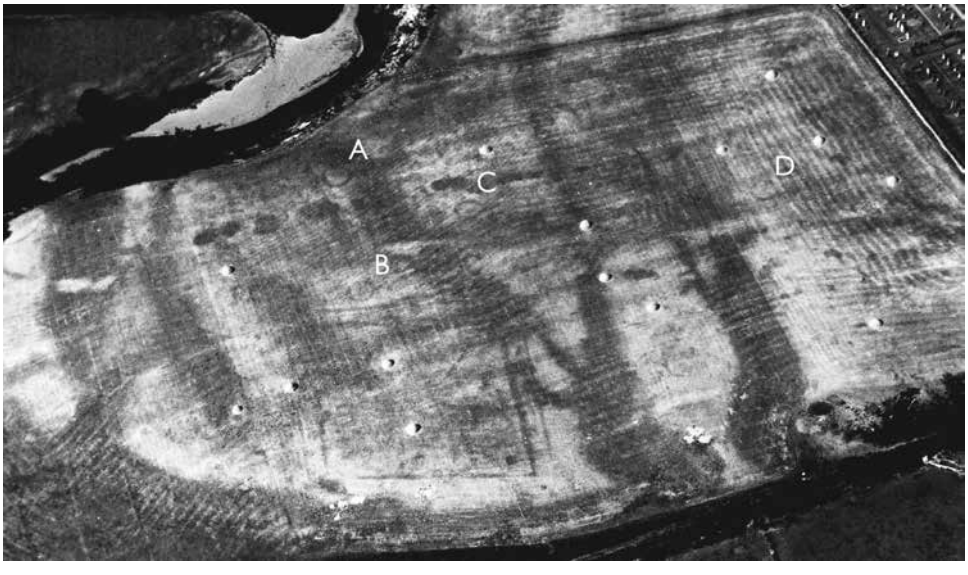


Figure 2. Extract of an aerial photograph taken in 1949 of Barwhill, recording the remains as differential responses of the grass crop to the pronounced drought of that year. The four ring ditches are labelled A to D. DV57, reproduced with permission of the Cambridge University Collection of Aerial Photography ©Copyright reserved.

This location has been photographed from the air on several occasions since 1949, both by Cambridge University and the former Royal Commission on the Ancient and Historical Monuments of Scotland (RCAHMS). The latter recorded the remains under an arable crop in 1978 and subsequently in 1984 as parching in grass. Selected images from these recording events will be discussed in detail below, in part because they were the images that informed the earlier aerial photographic interpretation (Cowley 1996), and because they illustrate some of the issues that may arise in interpreting such imagery.

1978 aerial recording

The field was recorded in 1978 under a cereal crop, when most of the archaeological features showed as lighter tones on the black and white photographs. This was due to the relatively greater biomass of the plants growing in the locally deeper soils above negative features such as pits and ditches. Five barrows are visible within the field (Figure 3: A–E), with the lines of the ditches of three of them appearing as slightly faceted. This characteristic led to the observation in the 1996 paper (Cowley 1996, 108) that one 'of the barrows is clearly square, while three appear to have at least one straight side' (A, B & C). In places the straight segments of ditch coincide with tractor tramlines in the crop. The earlier interpretation of these images also suggested that one of the barrows (C) might have a causeway interrupting the ditch at one of the angles and identified a burial pit at the centre of four of the barrows (A–D).

Figure 3. Extract of a 1978 aerial photograph of Barwhill, showing the remains as differential responses in an arable crop. KB1106 ©Historic Environment Scotland.

1984 aerial recording

The 1984 images were captured while the field was under grass, and, as is the case with St Joseph's 1949 photograph, areas of deeper soils such as buried ditches are visible as darker tones. By comparison with the 1978 images the archaeological features are less marked, though four of the barrows (Figures 2 & 3: A–D), part of the Roman road and quarry pits and the double-ditched enclosure are visible. The visible ring ditches appear to be circular.

Summarising the aerial photographic evidence

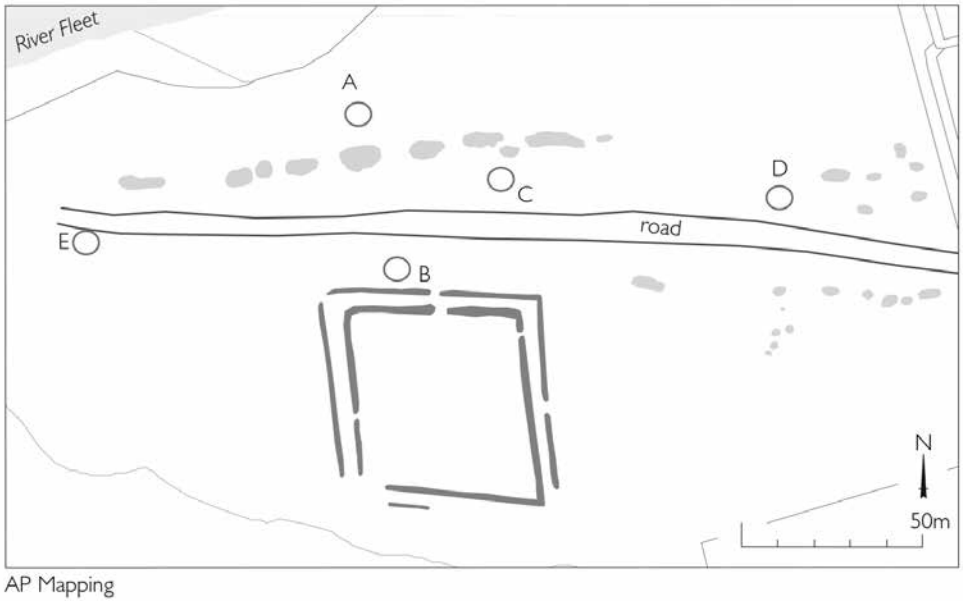
The review of the aerial photographic evidence, which records differential vegetation growth in both arable crop and in grass, supports a revised mapping (Figure 4, bottom right). This confirms the earlier mapping of the line of the Roman road and flanking quarry ditches, and of the double-ditched roughly square enclosure, which is assumed to be an example of a late Iron Age rectilinear settlement of a recurrent form in southern Scotland and northern England (RCAHMS 1997, 149–51; Cowley 2001, 172–3; Hodgson 2012). However, the recent review of the imagery prompted by the geophysical survey evidence (below) contradicts the earlier interpretation (Cowley 1996, 108). Taking the totality of aerial photographic evidence into account, rather than a reading of a selected set of images, indicates that the ring ditches are circular. The indications of straight segments in the lines of the ditches are only evident on the 1978 aerial photographs, and are in many cases coincident with tramlines in the crop which have contributed to the 'straightening' of the cropmarking — this characteristic is now believed to be an artefact of the cropmarking and farming practice rather than a true indication of the morphology of the ring ditches.

Most of the ring ditches are remarkably uniform on plan, measuring between about 5m and 6m in diameter within a ditch some 0.5m to 0.6m across. The somewhat intermittent nature of the visible lines of the ring ditches on the aerial photographs makes the presence of gaps in the ring ditches difficult to establish. However, the albeit fuzzy evidence for pits within the interiors of four of the ring ditches does appear to confirm their interpretation as the remains of ploughed-down ditched barrows.

1949

1978

1984



AP Mapping

Figure 4 (this and facing page). Rectified images from the aerial photographic record of the remains at Barwhill, recording the features as parching in grass (1949 and 1984) and cropmarking in an arable crop (1978), with a composite mapping of the aerial evidence. The photographs and mapping are to a common scale. Top left: DV57, reproduced with permission of the Cambridge University Collection of Aerial Photography ©Copyright reserved. GV007608 ©Historic Environment Scotland.

The geophysical survey

Two phases of geophysical survey have been carried out at Barwhill, with magnetic and earth resistance surveys conducted in 2012 (Carey 2013) and magnetic survey alone in 2014, both in the framework of the *Discovering Dumfries and Galloway's Past*[5] community archaeology project. The data was visualised as grey-scale images and processed with Geoplot v. 3. The field lies in an area of sedimentary geology, usually well suited to survey by geophysical methods, and the soil is a freely drained brown earth (Soil Survey of Scotland 1981).

Magnetic survey

The magnetic survey undertaken in 2012 covered 8,800 m^2, with the 20m × 20m survey grids aligned on the NNW–SSE wall of the Girthon cemetery. The instrument used was a Bartington Grad 601–2 dual fluxgate gradiometer at sample and traverse intervals of 0.25m and 0.5m respectively. The survey (Figure 5) revealed morphologically distinctive circular and linear anomalies, as well as a scatter of small (< 1m) bipolar anomalies which are likely to be items of (modern) iron on or close to the ground surface. Indeed, there is a rash of rather amorphous anomalies across the surveyed area, but the discussion below focuses on those features that are readily interpretable as archaeological and does not dwell on anomalies that may be modern or geological in origin.

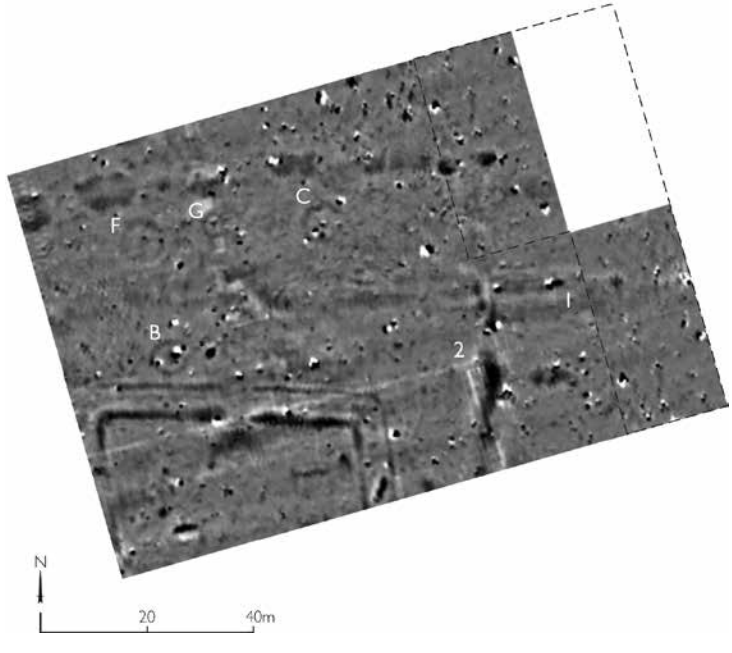


Figure 5. Grey-scale graphics of the magnetic survey (black-white palette +/−10nT), with annotations referred to in the text. The white line running left to right across the southern part is an unfortunate processing artefact. The pecked line indicates the area surveyed by earth resistance (Figure 6). Survey data Richard Jones & Giles Carey.

5 <https://discoveringdgpast.wordpress.com/>, last accessed 17/01/2020.

The two parallel ditches around the northern half of the enclosure and the gap through them stand out very clearly (Figure 5). Less distinct are a range of anomalies of uncertain identity within the interior. To the north of the enclosure are four circular narrow ring ditches measuring between 3.5m and 6.5m across internally. Each has either a single small (*c*. 1–2m across) circular positive anomaly at the centre, or more than one (and larger) anomaly. Two of these ring ditches (Figure 5: B, C) correspond with those recorded in the aerial photographic record, while two (F & G) are only clearly visible in the magnetic data. Two of the ring ditches (C & F) are penannular on plan**.** The small central anomalies are interpreted as a possible burial pit. The fourth ring ditch (G) is the smallest of the group, measuring 3.5m in diameter and defined by a ditch about 0.6m across, and does not appear on the aerial photographs.

Running across most of the surveyed area from roughly east to west is a linear feature consisting at its eastern end of a slight positive anomaly flanked by negative anomalies (Figure 5: 1). At its clearest it measures nearly 7m across, but moving westward the signature not only changes somewhat but also becomes progressively less pronounced; this may be due to differential preservation**.** In any case, this feature corresponds to the line of the Roman road identified from the aerial photographs. To the north of the road line, there is a row of roughly circular and oval positive anomalies that broadly match the quarry pits identified on the aerial photographs. In the vicinity of the barrows, the road line is affected by a series of partially interconnected negative anomalies that form a rough line extending northwards to the edge of the survey area. The origin of these anomalies, and of a small slightly curving anomaly that intersects the road to the east (2), is not known.

Earth resistance

The earth resistance survey was undertaken in 2012 across six 20m × 20m grids (Figure 6), using a Geoscan RM15 resistivity meter with sample and traverse intervals of 1m. The readings of electrical resistance varied widely (310 to 620 ohms) which was surprising in view of the relatively flat terrain and uniform soil type. The reasons for this are not clear. The grey-scale graphic lacks the clarity of the magnetic survey, but nonetheless a short stretch of the road is just evident (Figure 6: 1), against a background of natural features. The area of the quarry pits (3), lying within an area of low resistance, lacks definition, with ambiguous anomalies to the north.

Summarising the geophysical survey evidence

The geophysical surveys cover a relatively small area but contribute significantly to the archaeological interpretation. The magnetic survey provides additional detail for the boundaries of the late Iron Age enclosure, for the road and quarry pits, and for the barrows known from the aerial photographic record. The data also appear to provide marginally more precise representation of the buried features by comparison with the aerial photographs, where the proxy of the crop growth may introduce a slight lack of definition. In addition, the magnetic survey provides unique evidence for the existence of two barrows, and hints at uneven preservation in the line of the road.

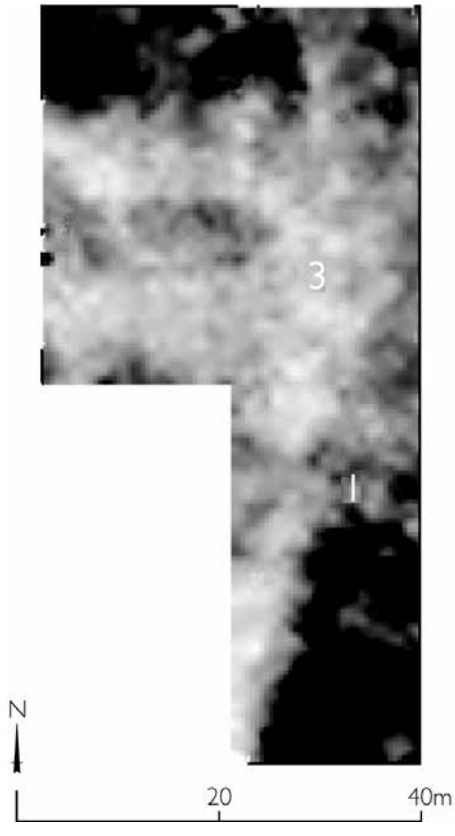


Figure 6. Grey-scale graphic of the earth resistance survey (data clipped at 3 standard deviations; white-black palette 312–620 ohms). Survey data Richard Jones & Giles Carey.

Airborne Laser Scanning data

The exploration of the field at Barwhill through the aerial photographic record and geophysical survey data is complemented by Airborne Laser Scanning (ALS)[6] data, which comprises a 'cloud' of points recorded by a laser scanner mounted in an aircraft (Opitz & Cowley 2013). This point cloud, which will include points on the ground, on buildings and on vegetation, can be processed to produce visualisations of the ground surface for use in archaeological interpretation. The ALS data used here is part of a coverage of selected areas between March 2011 and May 2012, mainly within river valleys, commissioned by the Scottish Government, SEPA and Scottish Water collaboratively for flood risk management.[7] The point density is a minimum of 1 point/m^2, and approximately 2 points/m^2 on average between the collection areas.

6 Also known as LiDAR/lidar (Light Detection And Ranging).

7 This data is part of 'LiDAR for Scotland Phase 1' (<https://remotesensingdata.gov.scot/>).

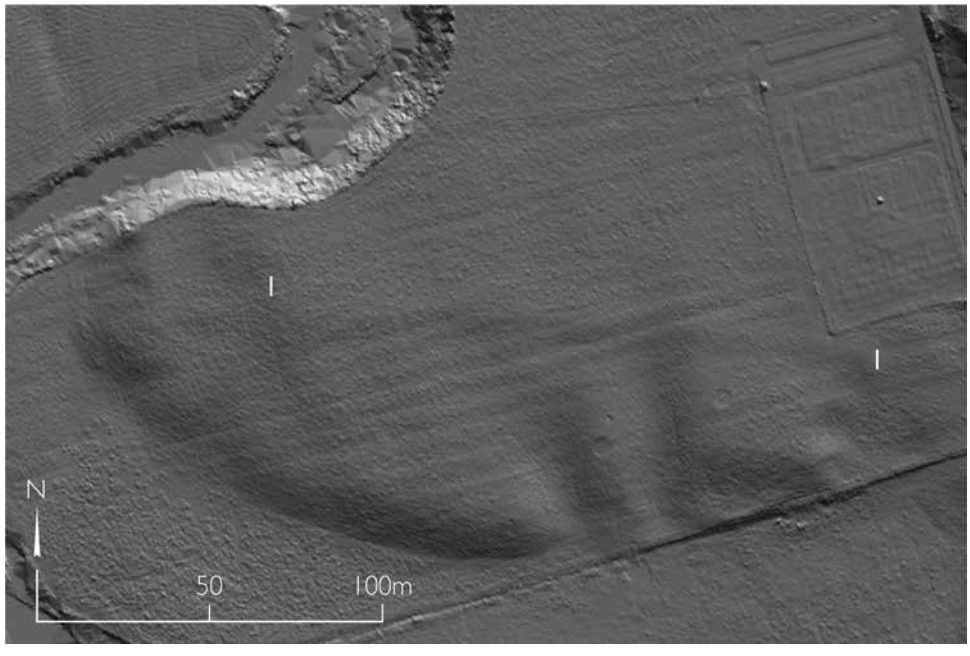


Figure 7. A 'hillshade' visualisation of the ALS data, lit from three directions with an incident angle of 25° in order to highlight low relief and ensure that lighting direction does not unduly influence the visibility of features. In this intuitively readable description of how the relief surface reflects incoming illumination, the line of the agger of the Roman road is evident as a ridge extending across the field east to west (1 – 1). On the ground this is a very subtle feature that rises to no more than about 0.6m in height over the 7m width of the road. The straight parallel lines running from ENE to WSW across the field are the remains of ploughing of nineteenth and twentieth century date. GV007609 ©Historic Environment Scotland. ALS data: Crown copyright Scottish Government, SEPA and Scottish Water (2012).

The ALS data-derived visualisations for Barwhill provide a detailed rendering of the topographic setting, highlighting the terrace edge location of the enclosure and the slight linear depressions that still indicate the lines of ancient water drainage features. More surprisingly, the data captures a low linear swelling measuring about 7m across in the surface of the field that corresponds to the line of the Roman road (Figure 7). This illustrates one of the strengths of the digital topographic data in creating visualisations that can vary the direction and angle of lighting, for example, to bring out even slight topographic features that might be difficult, or impossible, to recognise in the field. This data indicates that the agger, or bank, that formed the core of the road survives in slight relief, though presumably with the upper layers truncated by ploughing.

Discussion

The level of agreement between the aerial photographic and geophysical survey evidence is good, adding certainty to the archaeological interpretation of the cropmarking and

geophysical anomalies which is summarised below. The ALS data highlights the signature of the Roman road and provides a detailed rendering of the topographic context for the remains.

A key outcome from the work reported here is that the earlier assertion that one of the barrows at Barwhill is square, and that other barrows have straight sides, is unjustified. That interpretation privileged the observation of a single episode of aerial photographic recording, and failed to marshal different information visible across a series of different aerial photographs. This illustrates the importance of critical assessment of multiple sources to create greater confidence in observation and interpretation. Moreover, it shows the extent to which archaeological interpretations may be subject to bias due to preconceptions — 'seeing what you want to see'.

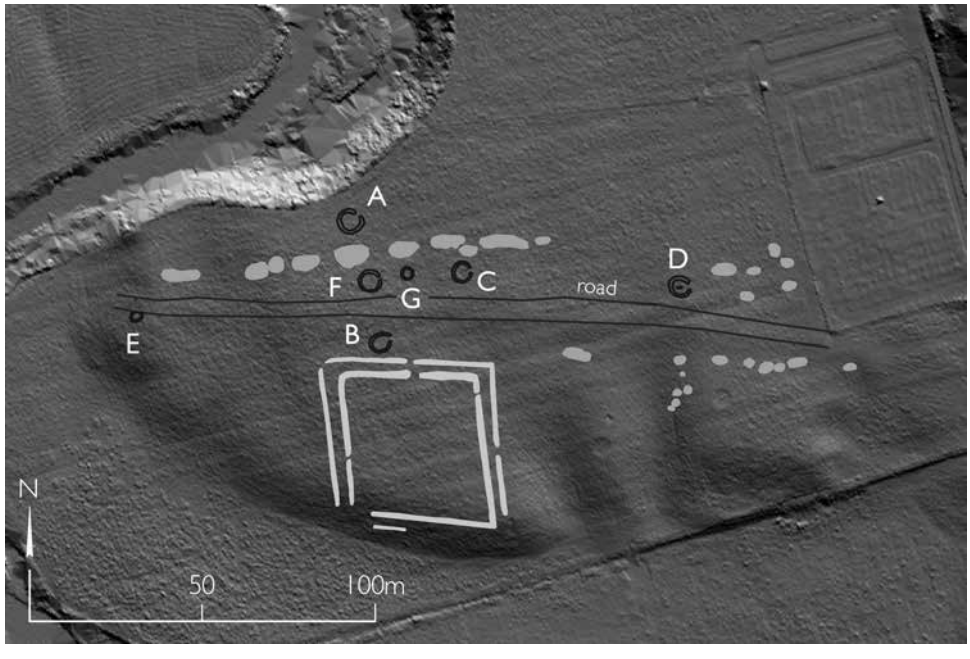


Figure 8. Composite interpretative mapping of the archaeological remains identified at Barwhill, combining results from analysis of aerial photographic records and geophysical survey data against the background of an ALS-derived hillshade visualisation. GV007610 ©Historic Environment Scotland. ALS data: Crown copyright Scottish Government, SEPA and Scottish Water (2012).

An integrated interpretation

Looking in detail at the discrete area on which this paper is focused has provided enhanced evidence for the character of the features there (Figure 8). In the area covered both by aerial photographs and geophysical survey there is evidence for four circular ring ditches, at least two of which are penannular with a causeway to the east, and indications of burial pits in the interiors. Together, these characteristics suggest that the ring ditches are the remains of a cemetery of at least seven barrows, including those just outside the area of the geophysical

survey. These form part of a poorly understood corpus of such sites in southern Scotland which is briefly summarised below. The barrows lie on a terrace, which is also occupied by a double-ditched rectilinear enclosure, probably of late Iron Age date. Six of the barrows can legitimately be described as flanking the line of the Roman road that runs across the terrace. Four barrows lie in the space between the recorded edge of the road and the quarry pits on the north, which presumably provided the building material for the road. This could be coincidental, but the spatial arrangement is very striking, and raises questions about the chronological relationship of the barrows and road — unfortunately a question that the survey records cannot resolve. It is, however, tempting to suggest that the layout of the barrows and the line of the road respected each other in some manner. A degree of symmetry is also evident between the line of the northern side of the rectilinear enclosure and that of the road, with the entrance facing on to the line of the road. The relative chronology of these remains, and their potential associations, will not be established through the survey data, but the interpretive mapping of the features helps to add detail to the record of the site, highlighting questions about the interrelationships of these three monuments types that could be addressed through excavation.

Seeing what you want to see

The earlier identification of a square barrow at Barwhill, and the subsequent revision of that interpretation presented in this paper, is an illustration of how archaeological interpretations are conditioned by varying observational abilities, experience and knowledge (see Bennett, Cowley & De Laet 2014, 898–9; Cowley 2015; Halliday 2013). Our abilities to identify patterns is a strength in analysing visual data, but can sometimes mislead, for example in a tendency to 'complete the circle' where features are fitted to the template of a familiar shape — or in this case to 'square the circle' driven by a desire to find square barrows. Expectation and our existing knowledge-base will bias what we see, or do not see, and how we interpret it. This example is presented here because such factors are rarely examined or held to account, but rather the complex mix of observation, feature identification, classification, interpretation and narrative are taken for granted as an unexplored and unchallenged aspect of archaeological practice. Whether examining cropmarking on aerial photographs or variable magnetic responses in geophysical data, archaeologists rely on pattern recognition combined with an understanding of likely geophysical and crop responses (e.g. high-low resistance or positive-negative magnetic; stunted or stressed crops/variation in biomass) to interpret the data. But in the course of this process, led by archaeological judgement, a proportion of what has been recorded is filtered out as unidentifiable, archaeologically or otherwise, because it is deemed too small in size, coherence or signal strength to warrant confident interpretation. Addressing this broad issue of bias or selectivity is therefore partly a matter of awareness, but, as Barwhill also illustrates, structured review of available data and combining different sources of information can offset this tendency.

Analogy and context: groups of circular barrows in south-west Scotland

The group of barrows at Barwhill have a basic morphology — they are circular on plan, bounded by a ditch up to about 1.2m across that encloses an area of between 3.5m and 6.5m in diameter. In some cases the ditch is broken by a causeway and there is a central

burial pit, which may be elongated but not necessarily in a pronounced manner. In seeking analogous sites there is a thin scatter of potentially similar monuments known from the survey record, but a distinct paucity of excavated and dated sites makes establishing a secure context for them difficult.

In the RCAHMS publication based on the survey of eastern Dumfriesshire, seven examples of small single ring ditches are identified, 'none of which is more than 6m in diameter within a ditch about 1.5m in breadth' (RCAHMS 1997, 105). These are identified as likely to be the remains of small barrows, and marshalled in a broadly Bronze Age context, with a range of penannular ring ditches, albeit of generally larger dimensions, marked on a map of potentially Neolithic monuments in the same volume (RCAHMS 1997, 114–6, Fig. 111). Amongst these single ring ditches are examples known from the aerial photographic record in the vicinity of Dunragit and Glenluce, which lie close to the known line of the Roman road in that area. For example, a barrow about 7.5m in diameter within a ditch c. 1.5m across lies 100m west of the Roman road as it runs above the east bank of the Water of Luce to the south of Glenluce (Canmore id: 82336). At Whitecrook, to the east of Dunragit, another example that lies close to the road line comprises a penannular barrow about 7.5m in diameter within a ditch 1.8m across, with an adjacent continuous ring ditch 1.6m across that encloses a much smaller area of 1.8m in diameter (Canmore id: 81308). The spatial relationships with the Roman road are less immediate than at Barwhill and may be as much a product of survey bias as any past association (see Cowley 2016, 62 and Figure 5.3, and Jones 2005 for the impact of Roman research interests on survey results). On balance, while the basic morphology of some individual barrows invites comparison with Barwhill, these occur singly rather than in groups and tend to have somewhat broader, more pronounced ditches, and thus may be a less immediately useful source of analogy.

A potentially more relevant analogy is suggested by a group of four small ring ditches at Trailflat (Cowley & Brophy 2001, 59–60; Canmore id: 66303). These range from 3m to 6m in diameter and lie in a rough close-set row, though the ditches appear to be continuous, and possibly broader than at Barwhill. At Kirkmabreck there is a slightly curving close-set row of at least eight ring ditches (Canmore id: 61119), of which three were sampled by excavation by Tessa Poller. One of the ring ditches measured 4.2m in diameter, with an oval pit measuring 1.8m from north-east to south-west by 1.1m transversely, but is at present undated.

Other potentially similar barrows are evident in Galloway (e.g. Little Lochans (Canmore id: 79389 & 79390) and Challoch (Canmore id: 81596)), and there are small ditched barrows surviving as earthworks thinly scattered across the Southern Uplands. However, dating evidence is poor, and while many may well be of Bronze Age date, others may date to the Iron Age or later (Cowley & Brophy 2001, 59–60). The earthwork examples are predominantly circular (e.g. Canmore id: 48594 & 48618), and include a cairn excavated at Alnham in Northumberland (Jobey & Tait 1966) which lies within a five-sided ditch characterised by shallow facets between slightly bowed sides, for which a first century BC date has been tentatively proposed.

The possibility for some small ditched barrows in south-west Scotland to date to the middle to late first millennium AD has also been raised (Cowley 1996), based on some broad morphological similarities with clustered and linear barrow and cairn cemeteries

concentrated in the eastern half of Scotland to the north of the Forth, with examples in the northern and western isles (Alexander 2005; Stevenson 1984; Mitchell 2020). The refutation of the 'square barrow' at Barwhill (above) may undermine these potential connections, but the examples at Brough Road (Orkney; Canmore id: 1804) and Groats Loch (Highland; Canmore id: 9065) comprise solely oval, round or facetted examples with no square constructions known. Excavated examples of round barrows at Pityoulish (Highland; Canmore id: 15389) and Garbeg (Highland; Canmore id: 12633) are irregular or facetted on plan. Although penannular barrows are more difficult to distinguish as cropmarks, there are examples known from the cemetery at Croftgowan (Highland; Canmore id: 14890), for example. However, it is worth noting that the distributions of the mid to late first millennium AD cemeteries in the east and north remain stubbornly discrete from those under discussion here in the south west. Nevertheless, in looking for groups of small barrows as potential analogies for Barwhill, the first millennium AD material north of the Forth includes some of the morphologically most similar material in Scotland. The site at Newton on Islay (McCullagh 1991), comprising at least 17 annular and penannular ring ditches ranging from 4m to 10m in diameter and arranged in a rough row, is also strikingly similar in some respects. The three excavated penannular ring ditches, which unfortunately did not provide any datable material, each enclosed an elongated pit aligned roughly from east to west, presumed to be a grave. The excavator noted (ibid., 48–9) that such alignments are rare in Bronze Age contexts, rather suggesting an Iron Age or early medieval context.

Another potential source of analogy are Roman period cemeteries, which will be illustrated briefly here with reference to Petty Knowe, which lies beside the Roman road of Dere Street and some 400m from the fort at High Rochester in Northumberland (Charlton & Mitcheson 1984; Historic England 2020). The excavated burials include those comprising a mound bounded by a ditch, with an external bank in some cases, ranging in overall size from 3m to 7m in diameter. A broad date range from the early second century to the late third century AD is indicated from the inclusion of Roman coins, pottery and nails. Looking beyond the excavated features, the basic shared morphology is evident in the site plan (Charlton & Mitcheson 1984, Figure 2), with the discussion of sites that may be analogous to High Rochester (ibid., 19–22) providing a list of further potentially similar sites. While a comprehensive review of Roman period burial in northern England and southern Scotland is beyond the scope of this paper, the similarities between aspects of the morphology of the remains at Petty Knowe and Barwhill is striking enough to suggest it warrants further exploration.

Conclusion

The group of small barrows at Barwhill does not have immediate unambiguous analogies in the excavation record, and while the survey record provides a range of potentially similar sites, none are satisfactory as unarguably the same type site. Indeed, based on basic morphology, the first millennium AD barrow cemeteries north of the Forth, albeit excluding the 'square barrow' component in this case, the Roman cemetery at Petty Knowes in Northumberland and the undated barrows on Islay, represent the best analogues. The ambiguities that attach to the interpretation of Barwhill, and the potential for it to fall into

a late Iron Age, Roman period or first millennium AD context, highlight the importance of targeted excavation as these are periods for which our knowledge of burial practice in south-west Scotland is limited. The character of the remains at Barwhill highlight the potential of targeted excavation to yield illuminating results. The negative features such as the quarry pits may have trapped informative sediments and the surviving agger could have sealed deposits, while the close spatial arrangements of the different monument types offers an opportunity for relatively small-scale excavation to produce a significant advance in knowledge.

Acknowledgements

Our thanks to Katrina Gilmour and Georgina Brown for producing the illustrations in this paper, to Cambridge University Collection of Aerial Photography for permission to reproduce Figure 2, to Tessa Poller for information about Kirkmabreck, and to Rog Palmer and Robin Turner for comments on the text. R.J. and G.C. thank the volunteers who took part in the geophysical surveys.

The Society is grateful to Historic Environment Scotland for a grant towards the publication costs of this article.

Bibliography

Alexander, D. 2005. Redcastle, Lunan Bay, Angus: the excavation of an Iron Age timber-lined souterrain and a Pictish barrow cemetery. *Proceedings of the Society of Antiquaries of Scotland*, 135, 41–118.

Bennett, R., Cowley, D. & De Laet, V., 2014. The data explosion: tackling the taboo of automatic feature recognition in the use of airborne survey data for historic environment applications. *Antiquity*, 88 (341), 896–905.

Carey, G. 2013. *Discovering Dumfries & Galloway's Past: Geophysical survey at Barwhill, Gatehouse-of-Fleet: Interim report*. <https://discoveringdgpast.files.wordpress.com/2013/02/gatehouse_interim_report_new.pdf>, last accessed 25/01/2020.

Charlton, B. & Mitcheson, M. 1984. The Roman cemetery at Petty Knowes, Rochester, Northumberland. *Archaeologia Aeliana*, 5th series, XII, 1–31.

Cowley, D. 1996. Square Barrows in Dumfries and Galloway. *TDGNHAS*, 3rd series, 71, 107–114.

Cowley, D. 2001. Site morphology and regional variation in the later prehistoric settlement of south-west Scotland. In Harding, J. & Johnston, R. (eds). *Northern Pasts – Interpretations of the Later Prehistory of Northern England and Southern Scotland*. 167–176. British Archaeological Reports 302: Oxford.

Cowley, D. 2015. Aerial photographs and aerial reconnaissance for landscape studies. In Chavarria Arnau, A. & Reynolds, A. (eds). *Detecting and Understanding Historic Landscapes*. 37–66. PCA Studies 2. SAP: Mantua.

Cowley, D. 2016. Creating the cropmark archaeological record in East Lothian, southeast Scotland.

In Crellin, R., Fowler, C. & Tipping, R. (eds). *Prehistory without Borders: Prehistoric Archaeology of the Tyne-Forth Region*. 59–70. Oxbow: Oxford.

Cowley, D. & Brophy, K. 2001. The impact of aerial photography across the lowlands of south-west Scotland. *TDGNHAS*, 3rd series, 75, 47–72.

Halliday, S.P. 2013. I Walked, I Saw, I Surveyed, but what did I see? … and what did I survey? In Opitz, R. & Cowley, D. (eds). *Interpreting archaeological topography: airborne laser scanning, 3D data and interpretation*. 63–75. Oxbow: Oxford.

Historic England, 2020. *Petty Knowes Roman Cemetery and Length of Dere Street Roman Road, Rochester*. <https://historicengland.org.uk/listing/the-list/list-entry/1009924>, last accessed 26/01/2020.

Hodgson, N. 2012. The Iron Age on the Northumberland Coastal Plain: general conclusions. In Hodgson, N., McKelvey, J. & Muncaster, W. *The Iron Age on the Northumberland Coastal Plain*. Tyne & Wear Archives & Museums: Newcastle upon Tyne.

Jobey, G. & Tait. J. 1966. Excavations on palisaded settlements and cairnfields at Alnham, Northumberland. *Archaeologia Aeliana*, 4th Series, 44, 5–48.

Jones, R.H. 2005. The advantages of bias in Roman studies. In Brophy, K. & Cowley, D. (eds). *From the Air: understanding aerial archaeology*. 86–93. Tempus: Stroud.

McCullagh, R. 1991. Excavations at Newton, Islay. *Glasgow Archaeological Journal*, 15, 23–51.

Mitchell, J. 2020. *Monumental landscapes: the early medieval barrow and cairn cemeteries of northern and eastern Scotland*, (Unpublished PhD Thesis. University of Aberdeen).

Opitz, R. & Cowley, D. (eds) 2013. *Interpreting archaeological topography: airborne laser scanning, 3D data and interpretation*. Oxbow: Oxford.

RCAHMS 1997. *Eastern Dumfriesshire – an archaeological landscape*. The Stationery Office: Edinburgh.

Soil Survey of Scotland 1981. <https://soils.environment.gov.scot/maps/soil-maps/>, last accessed 17/01/2020.

St Joseph, J.K. 1951. Air Reconnaissance of North Britain. *Journal of Roman Studies*, 41 (1–2), 52–65.

St Joseph, J.K. 1976. Air Reconnaissance of Roman Scotland, 1939–75. *Glasgow Archaeological Journal* 4, 1–28.

Stevenson, J.B. 1984. Garbeg and Whitebridge: two square-barrow cemeteries in Inverness-shire. In Friell, J. G. P. & Watson, W. G. (eds). *Pictish Studies. Settlement, burial and art in Dark Age northern Britain*, 145–50. British Archaeological Reports British Series 125: Oxford.